Student Resource 8.5

Reference Sheets: Diagnostics

Sonographer (Diagnostic Medical Sonographer)

Pathway: Diagnostics

**A special view**

Marta was nervous. What if the sonogram showed that something was wrong? When Louisa came into the exam room, Marta expressed her concerns. Louisa patiently explained the procedure so that Marta knew what to expect. Then Louisa spread a special gel on the skin of Marta’s abdomen.

Louisa gently ran the transducer, which transmits sound waves, across the skin. An image of the fetus appeared on the viewing screen. Marta relaxed immediately; she could see her baby moving its arms. Louisa said, “The doctor will have the final say, but your pregnancy appears to be progressing normally.”

Louisa took several images of the baby. She decided which images to give to Marta’s doctor. She printed one of the images and gave it to Marta to share with her husband. Then, as she wiped off the gel, she explained that Marta’s physician would be in shortly to discuss the results of the fetal ultrasound.

**Generating images of the body**

Louisa is a sonographer. Sonographers operate the equipment used to perform sonography, or ultrasonography, which is the use of sound waves to generate images of the inside of the body. A physician interprets the images. Sonographers are responsible for explaining the procedure to a patient, selecting appropriate equipment settings, and performing the procedure. When doing the procedure, they are responsible for looking for subtle visual cues that indicate abnormalities. They must decide which images to electronically store and show to the physician. Depending on the policies of the medical office, they may conduct a preliminary analysis of the findings. Sonographers also keep patient records, maintain equipment, and prepare work schedules. Most sonographers are employed by hospitals, but they also work in the offices of physicians and medical and diagnostic laboratories.

Louisa used the sonograph to track the growth and health of fetus, which is a common use of sonographs. The procedure is called a fetal ultrasound. The technology is also used to diagnose and treat other medical conditions. Abdominal sonography is used to create images of the liver, kidneys, gallbladder, spleen, and pancreas when looking for tumors and other abnormalities. Neurosonography is used to create images of the brain.

**Qualities and skills**

Sonographers must be able to explain procedures to patients who, like Marta, may be nervous, so excellent communication and interpersonal skills are necessary. Also, good hand-eye coordination is important for capturing quality images.

**I think this would be a great career for me. What do I have to do to make it happen?**

Sonographers receive education and training in vocational-technical institutions, two-year colleges, or four-year universities. Coursework includes classes in anatomy, physiology, instrumentation, basic physics, patient care, and medical ethics. The American Registry for Diagnostic Medical Sonography (ARDMS) certifies each person who passes an exam. According to the US Department of Labor, in 2010 the median annual wage was $64,380.

**How can I prepare now?**

Focus on your mathematics, health, and science courses. Also, consider volunteering at a hospital or outpatient clinic.

Cardiographic Technician (EKG Technician)

Pathway: Diagnostics

**On a treadmill**

“Congratulations, Matthew. I see in your chart that your 60th birthday is tomorrow,” Darnell said.

“I don’t feel a day over 30,” Matthew said with a wink as he rolled up his sleeve for Darnell to take his blood pressure. Darnell explained the procedure for a treadmill stress test. Matthew got on the treadmill, and Darnell connected him to an ECG monitor, which traces electrical impulses transmitted by the heart. He took a baseline reading. Then he turned on the treadmill, and Matthew began walking. Darnel closely monitored Matthew’s heart performance on the screen. He gradually increased the treadmill’s speed to see the effect it would have on Matthew’s heart as he exerted more effort. When the test was over, Darnell asked Matthew to wait in the exam room for the physician who would discuss the results of the test with him.

**Measuring the health of the heart**

Darnell is a cardiographic technician. Cardiographic technicians specialize in electrocardiography, or ECG or EKG. (ECG and EKG are different names for the same thing.) Cardiographic technicians are one type of cardiovascular technicians whose primary role is to help physicians diagnose and treat problems of the heart and blood vessels. Technicians like Darnell attach electrodes to the patient's chest, arms, and legs. Then they manipulate switches on an ECG machine to obtain a reading. They print out a report that is interpreted by a physician. ECGs are done before surgery and as part of routine exams for older patients or patients with a history of heart problems.

For a treadmill stress test, technicians are responsible for recording the patient's medical history, explaining the procedure, connecting the patient to an ECG monitor, and obtaining a baseline reading and resting blood pressure. They are responsible for monitoring the heart’s performance while the patient is on the treadmill, as Darnell did.

In addition to interacting with patients, they schedule appointments, review patient files, and operate and care for testing equipment.

**Qualities and skills**

Cardiographic technicians must feel comfortable working with machines and technology. They also must be able to follow detailed instructions. One part of their job is being able to put patients at ease and explain procedures clearly to patients. Most technicians work in hospitals. According to the US Department of Labor, the median annual salary in 2010 was $49,410.

**This seems like an interesting career. What do I have to do to make it happen?**

Most cardiographic technicians earn an associate’s degree for entry-level employment, and then they receive on-the-job training from an ECG supervisor or cardiologist. This training takes about four to six weeks. A one-year certification program can be an alternative to on-the-job training. Many technicians already work in the health care field and become technicians to add a new skill to their skill set. Most employers require credentialing, which is available from Cardiovascular Credentialing International (CCI) and the American Registry of Diagnostic Medical Sonographers (ARDMS).

**How can I prepare now?**

Focus on your mathematics, health, and science courses. Being able to carefully follow instructions is a major part of the job, so practice developing your attention to detail now.

Phlebotomist

Pathway: Diagnostics

**The blood test**

Caitlin had been experiencing extreme fatigue. Her doctor wanted to rule out anemia and other conditions, so he ordered blood tests.

Fernando greeted Caitlin when she walked into the lab. He asked her to take a seat. Then he explained the steps he would take to draw blood. Caitlin said that the sight of needles made her queasy, so Fernando gently suggested that she look away. Caitlin rolled up her sleeve. Fernando applied a tourniquet to Caitlin’s arm and then disinfected the area where he would be drawing blood. He skillfully inserted the needle and drew the amount of blood needed to perform the tests Caitlin’s doctor had ordered. He withdrew the needle, applied a small bandage, and unwrapped the tourniquet.

“Wow, I barely felt a thing,” Caitlin said, turning back around to face him. Fernando informed Caitlin that her doctor would contact her with the results. As she left, Fernando began to label the blood samples.

**Extracting blood**

Fernando is a phlebotomist. Phlebotomists are trained to extract blood from a vein for testing. They are responsible for prepping the patient and drawing blood as painlessly and efficiently as possible. Then they are responsible for correctly labeling the samples. They are trained to handle any complications that may occur during the procedure, such as improperly drawn blood or patient stress. They are also responsible for processing and analyzing the samples using sophisticated lab equipment. Phlebotomists usually work in hospitals, commercial laboratories, physician's offices, blood banks, pharmaceutical firms, research institutions, and public health clinics.

**Qualities and skills**

Successful phlebotomists are calm and have excellent listening skills. Many people, like Caitlin, feel nervous around needles and blood, and part of the phlebotomist’s job is putting them at ease. Working with blood puts phlebotomists at risk for exposure to a variety of diseases, so astute attention to lab safety procedures is of the utmost importance. They must also be skilled at performing tasks with their hands.

**I think I’d excel at this job. What do I have to do to make it happen?**

Phlebotomists take different education routes. Many participate in a formal phlebotomy program, which typically last four to eight months, in addition to completing an associate’s or bachelor’s degree. Some receive on-the-job training. Certification as a phlebotomist is available through several national credentialing agencies. According to the job site Indeed.com, the average salary in 2011 was $29,000.

**How can I prepare now?**

Lab safety is an important part of the job, so focus now on developing the skills needed to adhere to procedures and policies during labs in your science classes.

Radiologic Technologists/Technicians (X-ray, CT, MRI, Mammogram)

Pathway: Diagnostics

**A painful fall**

The emergency room physician ordered an X-ray for Robert’s wrist. He had taken a bad fall while skateboarding and was in pain. Emma explained the procedure for an X-ray to Robert. She asked him to remove his watch and ring. She carefully positioned him on the exam table. Then she shielded Robert’s body with lead-containing covers so he wouldn’t be exposed to radiation. She focused the X-ray source at the proper height and angle above Robert’s wrist and placed the film holder in the correct position. She exposed Robert’s wrist to the beam. Then she set the equipment controls so that the image would develop properly. Finally, she removed the film to take to the radiologist and told Robert that the doctor would be in shortly to discuss the results.

**Taking images**

Emma is a radiologic technologist. Radiologic technologists and technicians obtain radiographs, or X-rays, for diagnostic purposes. They are responsible for preparing patients for radiologic examinations, which includes explaining the procedure. They position patients on exam tables and position equipment correctly to obtain the best image possible. They take the image and set the equipment controls to make sure that the film develops properly. One important part of their job is protecting themselves, their coworkers, and the patients from unnecessary exposure to radiation, so they are responsible for using radiation-protection devices appropriately. They also prepare work schedules, keep patient records, and maintain equipment. Most radiologic technologists work in hospitals.

Many radiologic technologists have specialties. Technologists who specialize in computed tomography are called CT technologists. CT scans produce cross-sectional X-rays of an area of a body, and these X-rays are used to make a three-dimensional image. Radiologic technologists who specialize in MRI are called MRI technologists. MRI also creates three-dimensional images using giant magnets and radio waves. Technologists who specialize in mammography are called mammographers. They produce images of the inside of the breast.

**Qualities and skills**

Radiologic technologists must follow physicians' orders carefully and accurately, so they are people who pay attention to details and know how to follow instructions. They also work well on a team. Since they must operate complicated equipment, they also must have mechanical ability.

**I think I’d thrive at the job. What do I need to do to make it happen?**

There are different educational paths to becoming a radiologic technologist or technician. Many professionals earn an associate’s degree or participate in a certificate program that takes about two years. Programs typically provide both classroom and clinical instruction in anatomy and physiology, patient care procedures, radiation physics, radiation protection, principles of imaging, medical terminology, positioning of patients, medical ethics, radiobiology, and pathology. Licensing varies from state to state. Many employers prefer to hire professionals who have received certification from the American Registry of Radiologic Technologists (ARRT). According to the US Department of Labor, the median annual wage in 2010 was $54,340.

**How can I prepare now?**

Focus on your mathematics, physics, chemistry, and biology classes. Since safety is such a critical part of the job, develop skills that will help you follow instructions precisely.

Radiologist

Pathway: Diagnostics

**Viewing the X-ray**

The X-ray technician asked Lupe to look at the X-ray of the patient’s chest. The patient had been showing symptoms of pneumonia, including coughing up green mucus, fever, and shortness of breath, so the patient’s physician had ordered a chest X-ray. Lupe examined the X-ray that the technician had delivered to her. Indeed, the X-ray confirmed that the patient had a lung infection. Lupe wrote a brief report and then conferred with the patient’s physician. They discussed the best treatment for the patient, and then the physician went to deliver the diagnosis to the patient.

**Making the analysis**

Lupe is a radiologist. Radiologists are physicians who specialize in radiology. It is their responsibility to analyze and interpret diagnostic imagery, like X-rays, CT scans, or MRIs. They confer with the patient’s physician to diagnose the patient and agree on an appropriate course of treatment. Many radiologists have subspecialties, which means that they focus on a type of radiology, such as neuropathology, emergency trauma, or head and neck.

**Qualities and skills**

Radiologists work closely with technicians, physicians, and other health care professionals; they must enjoy working as part of a team. They often supervise workers in the radiology department, so they need leadership skills and an interest in keeping up with advances in technology.

**I think I’d excel at this job. What do I have to do to make it happen?**

Radiologists, like other physicians, must have of bachelor’s degree and graduate from a four-year medical school. They must also pass a licensing examine and complete at least four years of residency. In addition, most radiologists are certified by either the American Board of Radiology or the American Osteopathic Board of Radiology. According to the job site Simply Hired, the average annual radiologist salary in 2012 was $99,000.

**How can I prepare now?**

Medical school is a vigorous and challenging experience. Academically prepare yourself by taking advanced classes, increasing your reading skills, and striving for a high GPA. Look for a summer internship or volunteer work at a health care facility.